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ANNUAL SUMMARY

PART C

STORMS AND DEPRESSIONS

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INDIA WEATHER REVIEW, 1950

ANNUAL SUMMARY

PART C

STORMS AND DEPRESSIONS

I.—DEPRESSIONS AND CYCLONIC STORMS

During the year, 4 cyclonic storms and 9 depressions formed in the Bay of Bengal and 3 depressions over land. The periods of activity of the 4 cyclonic storms and the greatest barometric depth observed in their field is summarised below :—

TABLE 1

S. No.	Region	Month	Date	Greatest observed barometric depth
1.	Bay of Bengal	June	8th to 12th	17·4 mb.
2.	Do.	September	12th to 19th	14·6 mb.
3.	Do.	November	16th to 20th	12·4 mb.
4.	Do.	December	2nd to 6th	13·0 mb.

A brief account of western disturbances during the year follows the detailed description of the cyclonic storms and depressions, and a list of the more important local storms along with a summary of the damage caused by them is added at the end together with a list of the localities in which winds of force 9 or more, unconnected with cyclonic storms, were experienced by ships in the Indian Seas.

1. Deep Bay of Bengal depression from 8th to 13th April 1950.—A ship which was situated at Lat. 5½° N., Long. 85½°E. reported thunderstorm rain at 18 G.M.T. on the 4th. A shallow low also appeared over the extreme southeast Bay of Bengal by the next morning, when Car Nicobar was nearly overcast and had a northeasterly wind. These unsettled conditions moved westwards and by the 7th morning a well-marked trough appeared over the extreme southwest Bay. Upper winds at Trincomalee on the Ceylon coast had backed to northeast between 2,000 ft. and 5,000 ft. a.s.l., and Colombo winds which had been westerly or southerly on the 6th evening became northerly. On the 8th morning continuous rain and winds of 15-20 knots were reported by a number of ships in the southwest Bay off the Coromandel coast, and a ship near Lat. 6°N., Long. 84°E. reported southerly winds with showers. All these suggested that a depression had formed with its centre near Lat. 6°N. Long. 83½°E. at 0830 hrs. IST. on the 8th.

The depression moved practically northwards initially and was centred near Lat. 8°N., Long. 84°E. on the 9th morning. It then took a northeasterly course and lay with its centre near Lat. 11°N., Long 86°E. on the 10th morning, and near Lat. 12½°N., Long. 87½°E. on the 11th morning. Upper winds along the Tenasserim coast had by then got into the grip of the cyclonic circulation upto a good height. The depression thereafter began to intensify and became deep by the 11th evening, when it was centred near Lat. 13°N., Long. 88°E. The deep depression continued to move northeastwards with an accelerated speed, and lay with its centre near Lat. 14½°N., Long. 90½°E. on the 12th morning and within a degree of Lat. 15½°N. Long. 93°E. on the same evening. Continuing to move in the same northeasterly direction, it passed inland across south Arakan coast during the early hours of the 13th, and filled up rapidly over lower Burma.

In the earlier stages of the depression, widespread rain occurred on the east coast of Ceylon on the 8th and 9th. As the depression moved northeastwards, rainfall became widespread in the Bay Islands between the 11th and 13th and along the Burma coast on the 13th. According to news paper reports, the depression was responsible for some damage to property and also loss of a few lives in Rangoon. A few noteworthy falls are given below :—

Port Blair.....2″ on 12th.

Kyakoye and Rangoon.....3″ each and

Tavoy and Victoria Point.....2″ each on 13th.

2. Deep depression in the Bay of Bengal from 23rd to 30th May 1950.—A temporary, but rather weak, advance of the southwest monsoon had occurred in the south Andaman Sea and the southwest Bay of Bengal by the 12th of May. On the 19th, the upper winds at Port Blair became easterly and following this, conditions gradually became unsettled over the south Andaman Sea. With a fresh surge of monsoon occurring by about the 21st, the unsettled conditions became more marked, and eventually concentrated into a depression with its central region near the Nicobar Islands, by 0830 hrs. I.S.T. of the 23rd. By this time a well marked cyclonic circulation had become established upto 10,000 ft. a.s.l. and Port Blair reported a negative pressure departure of 3·9 mbs. Two ships—S.S. Rajula (Lat.

8½°N., Long. 88°E.) and S.S. Glaucus (Lat. 6°N., Long. 95°E.)—also reported adverse weather. The depression moved initially in a northnorthwesterly direction, and at 0830 hrs. I.S.T. of the 24th was centred within half a degree of Lat. 10°N., Long. 92½°E. Thereafter, while moving in a northwesterly direction, it was intensifying gradually and lay as a deep depression with its centre near Lat. 11°N., Long. 90½°E. at 0830 hrs. I.S.T. on the 25th. By 1730 hrs. I.S.T. on the same day, it was centred near Lat. 12½°N. Long. 89°E. S. S. Jalaveera, which was then in the southwest quadrant of the depression and about 80 miles from the centre, reported the following observations :—

TABLE 2

Date	Time (G.M.T.)	Position		Wind		Pressure (mb.)	Weather (ww)
		Latitude	Longitude	Direction	Speed (knots)		
25-5-50	00	11·4°N	89·0°E	050°	13	1000·1	Intermittent drizzle.
Do.	06	11·1°N	88·8°E	310	25	1000·5	Squalls during past hour.
Do.	12	10·7°N	88·0°E	270	30	998·0	Precipitation within sight.
26-5-50	00	10·1°N	86·8°E	270	35	1000·2	Do.

The deep depression continued to move northwest and was centred near Lat. 13½°N., Long. 87½°E. at 0830 hours I.S.T. on the 26th, and near Lat. 14½°N., Long. 86°E. at 1730 hrs. I.S.T. of the same date. By the 27th evening, when it was centred about 150 miles southeast of Visakhapatnam the deep depression began to weaken. On the 28th morning, it had further weakened into a trough of low pressure off the Circars coast, and by the 30th it became unimportant.

Under the influence of the above depression, the southwest monsoon advanced into Travancore-Cochin on the 27th, and into Malabar-south Kanara on the 28th. Widespread rain felli n the above divisions between the 27th and 31st, with locally heavy to very heavy falls on the 28th and 29th. Fairly widespread rain also occurred in the south Peninsula between the 26th and 29th, and in coastal Andhradesa and Orissa on the 29th. An interesting feature of the rainfall associated with this depression was that although there was considerable incursion of moist air in Orissa and coastal Andhradesa, the rainfall did not commence there till a fairly late stage in the life of the depression.

Tables giving the district averages and particularly heavy falls are given below :—

TABLE 3

State and District	District averages on						Particularly heavy falls
	26th	27th	28th	29th	30th	31st	
TRAVANCORE-COCHIN							
Cochin	..	..	2·0″	3·9″	..	..	28th, Cochin 5·1″, 29th, Mukundapuram, 6·8″, Cranganore 7·4″.
MADRAS							
Malabar	..	..	..	3·1″	..	..	29th Ottappalam 5·1″, Badagara 8·1″, Kozhikode 6·6″, Triprayar 8.8″.

3. Cyclonic storm in the Bay of Bengal from 8th to 12th June 1950.—There was an appreciable fall in pressure along the Arakan and Chittagong coast on the 7th morning. Also the upper winds at Chittagong became southerly upto 10,000 ft. a.s.l., indicating development of a cyclonic circulation over the north Bay of Bengal. By the evening of that day cyclonic circulation in the upper air became more marked, with easterly winds over Calcutta upto 5,000 ft. a.s.l.

By 0830 hrs. I.S.T. on the 8th, the unsettled conditions in the north Bay of Bengal concentrated into a depression with central region near Lat. 19½°N., Long. 90½°E.; S.S. Maharaja (Lat. 19°20′N., Long. 89°02′E.), which was almost due west of the centre of the depression, reported a northwesterly wind of 20 knots, with overcast skies and rain at 0530 hrs. I.S.T. Available data over the sea area are rather meagre for fixing accurately the centre of the depression on the evening of the 8th, but it was then probably stationary at its earlier position. The depression later intensified into a deep depression, and was still centred near Lat. 19½°N., Long. 90½°E. at 0830 hrs. I.S.T. on the 9th. S.S. 'Sirdhana' (Lat. 18°N., Long. 91°E.), about 80 miles to the southsoutheast of the depression centre reported southwesterly wind of 30 knots with moderate continuous rain. By 1730 hrs. I.S.T. on that day, the deep depression had moved northwest and was centred near Lat. 20°N., Long. 90°E., about hundred miles to the southeast of Sandheads. Thereafter, intensifying rapidly and continuing to move in a northwesterly direction, the deep depression became a cyclonic storm of small core; which was about 70 miles southsoutheast of Calcutta at 0830 hrs. I.S.T. on the 10th. The cyclonic storm crossed the Sunderbans coast east of Saugor Island by the same afternoon and at 1730 hrs. I.S.T. was centred about 40 miles southwest of Calcutta. The following observations which were recorded in the weather diary of Sandheads and Saugor Island on the 9th and 10th, give some indication of the intensity of the storm :

SANDHEADS

9th.—Sky overcast with Altostratus. Slight drizzle commenced at 0146 I.S.T. and became intermittent thereafter. Wind N to N.E., force 4; Sea moderate with heavy swell; visibility good except when rainfall heavy. Continuous light to moderate precipitation continued throughout day.

10th—Sky overcast with NW wind, force 5, light rain since 0005 I.S.T. At 0230 hrs I.S.T., strong gale with winds reaching upto force 10; heavy rain with heavy sea and confused swell. At 0830 hrs. I.S.T. gale continued with waves about 40 ft. high, very poor visibility and continuous but light rain; wind direction W.S.W, force 10. By 1130 I.S.T., storm abating with wind speed about force 5/6. Rainfall continued till midnight.

SAUGOR ISLAND

9th.—Slight intermittent rain from 0000 to 0500 I.S.T.; sky cloudy with Sc/Cu; wind NNE, force 4; visibility clear; sea and swell moderate. Moderate intermittent rain from 1100 to 1730 I.S.T.; wind NNE, force 5; visibility bad. Strong gale started from 2000 hrs. I.S.T. and continued throughout night.

10th.—Strong gale with heavy rain still continuing; Wind N, speed 54 m.p.h.; visibility bad. Strong gale continued upto 2400 I.S.T.; wind changed to S.S.W. at 2000 I.S.T., speed about 45 m.p.h. Weather became normal after midnight.

After moving inland, the cyclonic storm gradually weakened, and lay as a deep depression with its centre about 30 miles northeast of Jamshedpur at 0830 hrs. I.S.T. on the 11th and as a depression centred midway between Hazaribagh and Dhanbad at 1730 hrs. I.S.T. of that day. Thereafter, it weakened rapidly and became unimportant near the Nepal hills by the 12th evening.

Under the influence of the above cyclonic storm the monsoon extended into West Bengal on the 11th June, and into the rest of northeast India by the 12th. Locally very heavy rain occurred in Gangetic West Bengal and Chota Nagpur on the 11th and in Bihar and sub-Himalayan West Bengal between the 12th and 14th. Some of the noteworthy falls were :—

Midnapore 10·9″ on the 11th,

Kurseong 20·8″, Darjeeling 17·9″, Jalpaiguri, and Purnea 10·3″ on the 12th; and

Kurseong 17·0″, Darjeeling 10·2″ on the 13th.

Heavy downpours over the hills caused severe landslides in Darjeeling, Kalimpong, Kurseong and the adjoining regions, as a result of which several people were killed and a large number of houses were destroyed. Darjeeling was completely cut off from the rest of the country for a number of days.

The district averages of rainfall, with some particularly heavy falls, which occurred in the area affected by the storm are given in the table below :—

TABLE 4

State and District	District averages on				Particularly heavy falls	
	10th	11th	12th	13th		
WEST BENGAL						
24 Parganas	..	..	..	..	Saugor Island (Obsy.)	7·5″ on 11th.
Nadia	..	2·5	3·1	..		
Murshidabad	..	..	..	..	Patkabari	4·9″ on 11th.
West Dinajpur	..	4·4	3·3	..	Gangarampur	9·8″ on 11th.
					Balurghat	9·1″ on 12th.
Jalpaiguri	..	3·1	4·5	..	Falakata	5·6″ on 11th.
					Buxa	5·5″ on 11th.
					Alipore Duars	6·7″ on 12th.
					Jalpaiguri	11·2″ on 12th.
Darjeeling	2·2	6·0	15·3	9·6	Kurseong	11·7″ on 8th.
					Mangpoo	7·0″ on 9th.
					Kurseong	10·3″ on 10th.
					Kurseong	19·7″ on 11th.
					Siliguri	6·9″ on 12th.
					Darjeeling	17·9″ on 12th.
					Kalimpong	11·9″ on 12th.
					Mangpoo	21·5″ on 12th.
					Kurseong	18·3″ on 12th.
					Siliguri	6·6″ on 13th.
					Darjeeling	10·2″ on 13th.
					Kalimpong	11·7″ on 13th.
					Mangpoo	15·0″ on 13th.
Cooch Behar	..	..	9·1	4·6	Sudder	10·4″ on 12th.
					Dinhata	10·6″ on 12th.
					Malhabanga	7·4″ on 12th.
					Mickliganj	13·5″ on 12th.
					Sudder	7·6″ on 13th.
					Dinhata	5·5″ on 13th.
Burdwan	..	2·3	..	..		
Bankura	..	..	..	..	Bankura	5·0″ on 11th.
					Taldangra	6·5″ on 10th.
					Indpur	5·3″ on 10th.
					Semlapal	6·1″ on 10th.
					Gangajalghati	6·1″ on 12th.

TABLE 4—*contd.*

State and District	District averages on				Particularly heavy falls	
	10th	11th	12th	13th		
Midnapore	3·6	2·5	..	..	Gopiballarpur	6·8″ on 10th.
					Moyna	9·5″ on 10th.
					Jangran	8·5″ on 10th.
					Kharagpur	9·5″ on 10th.
					Contai	6·1″ on 11th.
					Panskura	5·5″ on 11th.
					Balichak	7·1″ on 11th.
					Midnapore	10·9″ on 11th.
Howrah	..	4·6	2·9	3·1	Ulubaria	5·7″ on 12th.
CHOTA NAGPUR						
Manbhum	..	..	..	..	Manbazar	6·1″ on 11th.
Singhbhum	..	2·4	..	..	Bahragora	5·9″ on 11th
					Katbari	5·2″ on 11th.
EAST BIHAR						
Monghyr	..	..	..	..	Sheikpura	9·1″ on 11th.
					Gogri	5·1″ on 12th.
					Jamalpur	5·4″ on 12th.
Bhagalpur	..	3·4	..	..	Banka	6·5″ on 11th.
					Sonola	10·7″ on 11th.
Saharsa	..	..	3·1	..	Pratapganj	5·5″ on 11th.
					Supaul	6·3″ on 12th.
Purnea	..	..	4·3	..	Kishanganj	7·2″ on 12th.
					Araria	5·4″ on 12th.
					Purnea	10·3″ on 12th.
					Gondwara	5·5″ on 12th.
					Bahadurganj	7·5″ on 12th.
Santhal Parganas	..	..	3·0	..	Naya Dumka	6·2″ on 12th.
					Sahibganj	6·5″ on 11th.
					Godda	5·1″ on 12th.
					Pakur	6·2″ on 12th.
					Jamtara	5·5″ on 12th.
					Paraiya	8·3″ on 12th.
					Barharwa	6·5″ on 12th.
					Bario	5·2″ on 12th.
EAST UTTAR PRADESH						
Banaras	..	..	..	2·9	Banaras	8·5″ on 13th.

4. Shallow Bay depression from 23rd to 28th June 1950.—On the morning of 20th, the seasonal trough had begun to extend into the north Bay. Within the next two days a weak upper air cyclonic circulation developed over the area, and the trough became more pronounced. By 0830 hrs. I.S.T. on the 23rd, the unsettled conditions over the north Bay of Bengal concentrated into a depression, centred near Lat. 20½°N., Long. 89°E. The depression moved in a northwesterly direction and by 1730 hrs. I.S.T. was centred close to the coast near Saugor Island. It passed inland during the night, and on the 24th morning lay over Gangetic West Bengal, with its central region south of Bankura. Continuing to move northwest, the depression lay over east Chota Nagpur on the 25th morning and over southwest Bihar on the 26th and 27th. It then weakened and merged with the seasonal trough.

Under the influence of the depression a revival of the southwest monsoon occurred in northeast India on the 22nd. The monsoon also extended into east Uttar Pradesh on the 26th. Widespread rain continued over the above regions till the 28th.

The noteworthy district averages of rainfall and amounts of particularly heavy rainfall are given in the following table:

TABLE 5

State and District	District averages on 25th	26th	27th	28th	Particularly heavy falls
	in.	in.	in.	in.	
WEST BENGAL					
24 Parganas .	..	..	..	..	Alipore 5·5″ on 25th.
West Dinajpur .	2·6	2·5	..	..	
Midnapore .	..	..	..	..	Moyna 6·0″ on 23rd.
SOUTH BIHAR					
Patna . .	..	..	..	..	Ekangersarai 6·0″ on 25th. Barh 5·5″ on 26th. Hilsa 5·1″ on 26th. Bikram 5·3″ on 27th. Hilsa 5·2″ on 27th.
Shahabad .	..	2·6	2·9	2·1	Kochas 9·2″ on 26th. Sasaram 5·5″ on 27th. Mahama 5·5″ on 27th. Chenari 7·0″ on 27th. Basawan 8·1″ on 28th. Manoharpur 6·0″ on 28th.
Saran . .	..	..	2·7	..	Basantpur 6·7″ on 27th. Masrakh 6·9″ on 27th.
CHOTA NAGPUR					
Hazaribagh .	..	..	..	..	Barhi 5·4″ on 25th. Gola 5·3″ on 25th. Tundwa 5·1″ on 25th.
Manbhum .	..	..	..	..	Baghmundi 5·7″ on 23rd. Baghmundi 5·3″ on 24th.
EAST UTTAR PRADESH					
Pilibhit . .	..	3·1	..	..	
Banaras .	..	..	2·5	2·9	Banaras 5·2″ on 27th. Banaras 5·6″ on 28th.
Ghazipur .	..	3·2	5·7	4·5	Ghazipur 6·7″ on 27th. Saidpur Bhitori 7·0″ on 27th. Mohammadabad 5·8″ on 27th.
Ballia . .	..	2·9	..	2·5	Saidpur Bhitori 5·8″ on 28th. Ballia 6·8″ on 26th. Ballia 5·8″ on 28th.

5. Shallow Bay of Bengal depression from 10th to 12th July, 1950.—The seasonal trough extended into the head of the Bay of Bengal on the 9th and caused unsettled conditions there during the course of the next 24 hours. Several ships in the west central Bay off the Circars coast reported heavy continuous rain on the 10th which together with the cyclonic circulation in the upper air over the north Bay strongly indicated that a depression was apparently forming there. By 0830 hrs. I.S.T. of the 11th, the unsettled conditions concentrated into a shallow depression centred near Lat. 20°N., Long. 87½°E. Moving in a northwesterly direction it crossed the Orissa coast near Chandbali during the same night, weakened and lay as a low pressure area over north Orissa and the adjoining parts of Gangetic West Bengal and Chota Nagpur on the 12th. Thereafter, it weakened further and merged with the seasonal trough.

The following table gives some of the heavy rainfall emounts reported in connection with the above depression:

TABLE 6

State and District	Date of heavy rainfall	Place and amount
GANGETIC WEST BENGAL		
24 Parganas . .	14th	Gosaba 5·3″
UTTAR PRADESH		
Muzaffarnagar . .	12th	Kairana 5·2″
Fatehpur . . .	15th	Fatehpur 5·7″
MADHYA PRADESH		
Raipur . . .	12th	Gattasilli 5·3″
Bilaspur . .	12th	Mungeli 6·0″
Raigarh . . .	13th	Dharamjaigarh 5·3″
Raigarh . . .	15th	Dharamjaigarh 5·4″
Chanda . . .	11th	Dhanora 5·1″

6. Shallow land depression from 11th to 15th July 1950.—The seasonal low over Western Pakistan became well-marked by the 9th and the Arabian Sea branch of the monsoon current extended into Saurashtra and Kutch, Gujarat and Rajasthan by the 11th. A western disturbance was also moving eastwards across the North-West Frontier Province, the Punjabs and Kashmir on the 9th. In association with these conditions an upper air cyclonic circulation extending upto 10,000 ft. a.s.l. appeared over Rajasthan, Madhya Bharat and neighbourhood by the evening of 10th, which later developed into a shallow depression centred 50 miles west of Nowgong at 0830 hrs. I.S.T. of 11th. Moving steadily in a westnorthwesterly direction it lay successively over Rajasthan with its centre about 70 miles to the southeast of Jodhpur on the 12th morning and over Sind and adjoining parts of Rajasthan (centred near Barmer) on the 13th. It persisted over Sind being centred about 50 miles to the northnorthwest of Umarkot on the 14th and merged with the seasonal 'low' over Western Pakistan on the 15th. Associated with the formation and movement of this depression the monsoon was vigorous over Gujarat and Saurashtra and Kutch between the 12th and 14th when exceptionally heavy rain fell in that area. Very heavy rain ranging from 6″ to 15″ fell over most parts of Gujarat and Saurashtra, Dharampur and Bulsar recording falls of respectively 11·3″ and 7·7″ on the 12th and 9·1″ and 7·3″ on the 13th. Other notable rainfall amounts are, Rajkot and Bhuj 14·8″ and 13·9″ respectively during the 9 hours ending at 1730 hrs. I.S.T. on the 13th, Junagadh and Lilia Mota 9·1″ and 7·3″ respectively on the 13th and Gondal 11·5″ on the 14th. As a result of the heavy rains most of the rivers in Saurashtra were in spate and caused great damages. The worst affected areas were Morvi, Rajkot, Wankaner, Gondal and Jetpur where communications were paralysed and over 5,000 houses were damaged or destroyed, 45 persons were sported to have lost their lives and over 7,000 heads of eattle

were washed away in various parts of Saurashtra. Much damage was also caused to the standing crops and stored grains. The district averages of rainfall and the noteworthy amounts of rainfall for the period 12th to 15th are given in the following tables :

TABLE 7

State and District	District averages on 12th	13th	14th	15th	Particularly heavy falls
BOMBAY					
Kaira	3·4	2·9	..	..	12th, Kaira 5·5″, Anand 5·2″. 13th Kaira 6·2″, Wanghrolitank 6·0″.
Surat	4·8	4·5	2·7	..	12th Chikhli 6·1″, Bulsar 7·7″, Pardi 9·2″, Waghai 10·6″, Ahwa 8·7″. 13th Chikhli 5·0″, Bulsar 7·3″, Pardi 8·6″, Waghai 6·6″, Ahwa 6·6″. 14th, Jalalpor 9·5″. 15th, Jalalpor 5·1″.
West Khandesh	2·0	..	..	..	12th, Navapur 5·4″.
Nasik	2·6	2·5	..	..	12th, Igatpuri 8·8″, Trimbak 9·7″, Peint 7·6″. 13th, Trimbak 11·5″, Igatpuri 7·7″, Peint 7·0″. 14th, Trimbak 7·5″. 15th, Trimbak 5·1″.
Poona	..	..	..	..	13th, Lonavala 7·2″. 14th, Lonavala 7·2″.
Satara	..	..	..	2·0	12th Mahabaleshwar 7·6″. 13th Mahableshwar 6·3″. 15th, Panchghani 5·6″, Mahabaleshwar 9·1″.
Belgaum	2·0	..	..	..	
Thana	4·4	4·7	..	..	12th, Shahapur 7·2″, Mokhada 6·1″, Vada 9·1″. 13th, Shahapur 5·3″, Mokhada 9·2″, Dahanu 7·1″, Umbargaon 7·3″. 14th Mokhada 5·1″.
Kolaba	3·4	3·8	2·1	..	12th, Karjat 5·5″, Matheran 8·4″. 13th, Karjat 5·4″, Matheran 9·5″. 14th, Matheran 5·0″.
Ratnagiri	4·0	..	..	2·3	12th, Rajapur 6·4″, Sanghameshwar 7·7″, Lanja 5·9″, Kankavali 7·3″.

TABLE 8

Noteworthy heavy falls in Saurashtra and Kutch and the merged States

Date	Station with particularly heavy falls
12th	Gaganbavda 7·5″, Gargoti 5·8″, Radhanagari 6·9″, Balasinor 6·3″, Jambughoda 5·2″, Dharampur 11·3″, Banasda 7·7″, Baroda 6·5″, Songadh 5·3″, Amreli 8·2″, Radhanpur 6·7″, Jetpur 9·7″.
13th	Sawantwadi 5·7″, Radhanagari 7·4″, Rajpipla 11·1″, Dharampur 9·1″, Banasda 8·1″, Baroda 7·4″, Radhanpur 8·0″, Rajkot 15·7″, Gondal 8·6″, Dhorji 6·5″, Jetpur 9·1″, Junagad 9·1″, Dhrangadhra 5·2″, Vankaner 9·5″, Mandvi 5·5″.
14th	Radhanagari 7·5″, Banasda 5·7″, Nawanagar 6·9″, Gondal 11·5″, Dhorji 5·6″, Bhuj 13·9″, Aniar 8·8″, Rajkot 14·8.
15th	Gaganbavda 8·9″, Aniar 6·2″.

7. Bay of Bengal depression from 25th to 30th July 1950.—A low pressure wave from Burma was moving westwards across Eastern Pakistan and Gangetic West Bengal on the 23rd, when negative pressure departures were noticed over the head Bay of Bengal and adjoining land areas, and upper winds over Gangetic West Bengal had backed and become easterly. On the 24th morning, a concentrated fall of pressure and development of cyclonic circulation in the upper air upto 7,000 ft. a.s.l. over and near the head Bay suggested that conditions had become unsettled over the area.

By the next morning, the unsettled conditions developed into a depression which was centred at 0830 hrs. I.S.T. near Lat. 21½°N., Long. 88½°E. Moving in a westerly direction and intensifying slightly, the depression was centred at 0830 hrs. I.S.T. of the 26th about 50 miles east of Balasore, and moved close to north Orissa coast by the same evening. It passed inland during the night and weakened slightly. Thereafter the depression followed a more or less westnorthwesterly track and lay successively with its centre about 130 miles to the east of Pendra on the 27th, about 60 miles westnorthwest of Jabalpur on the 28th, and near Jhalawar on the 29th. It weakened thereafter rapidly and lay as a low pressure area over Sind and adjoining west Rajasthan on the 30th morning, and then moved away in a northerly direction as a low pressure wave.

In association with the above depression, the monsoon became active in Gangetic West Bengal on the 25th and 26th and in Orissa between the 25th and 27th. It was vigorous in northwest Madhya Pradesh and Madhya Bharat on the 28th and 29th and in north Gujarat and Kutch on the 30th. It also activated the monsoon over Sind on the 30th and 31st. Rainfall was exceptionally heavy in Madhya Bharat on the 29th.

The noteworthy district averages and some of the heavy falls are given in the following table :

TABLE 9

State and District	District averages on 27th	28th	29th	Particularly heavy falls
MADHYA PRADESH				
Raipur	..	..	..	27th, Khairdatan 5·2″.
Bilaspur	..	..	..	27th, Pondi Laja 5·0″.
Raigarh	3·1	..	..	27th, Sarangarh 10·4″.
Jabalpur	..	2·2	..	28th, Jabalpur 7·8″, Pariat 5·8″.
Mandla	..	3·0	..	28th, Niwas 5·2″.
Balaghat	..	2·1	..	28th, Waraseoni 5·5″.
Hoshangabad	..	3·1	2·6	28th, Pachmarhi 5·4″. 29th, Hoshangabad 7·7″, Seoni 5·1″.
Nimar	..	..	2·9	28th, Mandhata 6·4″. 29th, Harsud 9·5″.
Chindwara	..	2·0	..	
NORTH GUJARAT				
Panch Mahals	..	..	4·9	29th, Jhalod 12·1″.
MADHYA BHARAT				
Ujjain	2·9	9·2	..	27th, Ujjain 5·3″. 28th, Ujjain 11·3″, Khachrod 6·5″, Badnagar 8·0″, Sonkach 11·1″.

TABLE 9—*contd.*

State and District	District averages on			Particularly heavy falls
	27th	28th	29th	
Shajapur . .	2·3	6·0	..	28th, Shajapur 8·9″, Agar Western Malwa 7·9″.
Sardarpur . .	..	4·4	..	28th, Sardarpur 5·5″.
Indore . .	..	..	6·2	29th, Indore 9·8″, Depalpur 6·7″, Mhow 7·8″.
Nimar . . .	..	3·6	..	28th, Burwaha 6·5″.
Mahidpur . .	..	2·9	12·0	29th, Mahidpur 17·1″, Tarana 6·9″.
Bhopal Eastern District. . .	..	3·0	4·5	29th, Chiklod 8·0″, Kaliakheri (Goharganj) 9·4″, Sahaganj 8·5″, Salwani 5·0″.
Bhopal Western District . .	..	..	4·0	29th, Ashta 6·5″, Ichhawar 6·5″, Mardanpur 6·1″, Nasrullaganj 5·4″, Sehore (Qasba) 6·0″.
Narasingarh . .	..	2·6	..	
Dewas Senior . .	2·3	9·5	..	28th, Dewas Senior 9·5″.
Dewas Junior .	5·5	3·0	..	27th, Sarangpur 5·5″.
Khilchipur . .	..	2·7	..	
Southern Central India States Agency	..	3·7	..	28th, Jhabua 7·1″, Dhar 6·5″, Badnawar 8·2″.
Malwa Agency .	..	3·3	2·9	28th, Ratlam 13·2″. 29th, Sailana 12·0″, Ratlam 10·6″.

8. Land depression from 3rd to 7th August 1950.—The seasonal trough of low pressure over the Gangetic plain became well-marked in the beginning of August and a 'low' developed over south Bihar and the adjoining areas by the 2nd morning, apparently under the influence of a low pressure wave from the east. The 'low' later concentrated into a depression, and was centred at 0830 hrs. I.S.T. of the 3rd near Dumka. The depression took rather an unusual track initially. Moving southsouthwestwards during the first twentyfour hours, it lay over Gangetic West Bengal and north Orissa on the 4th morning, with its centre about 70 miles northwest of Balasore. By this time it had also gained somewhat in intensity. It then followed the usual westerly course and was centred near Jharsuguda on the 5th morning. Thereafter, moving rapidly in a northwesterly direction and weakening slightly it lay over Vindhya Pradesh and the adjoining north Madhya Pradesh on the morning of the 6th with its centre near Nowgong. Weakening further it then lay as a trough over Vindhya Pradesh, north Madhya Pradesh and the adjoining areas by the next day, and finally merged into the seasonal trough by the 8th.

The depression was responsible for a general strengthening of the monsoon over the region extending from Gangetic West Bengal and Orissa to east Rajasthan. Locally heavy rain fell in east Madhya Pradesh on the 4th and 5th, in north Madhya Pradesh and Vindhya Pradesh on the 6th, and in southeast Rajasthan on the 6th and 7th. Jhalawar reported 6″ of rain on the 6th. Isolated heavy falls were also reported from West Bengal and east Madhya Pradesh on the 3rd.

9. Bay of Bengal depression from 9th to 15th August 1950.—Upper winds upto 7,000 ft. a.s.l. over Calcutta and Chittagong were southerly till the evening of 6th August. On the 7th morning, Calcutta winds backed to northeast or north upto 3,000 ft. a.s.l., and a feeble cyclonic circulation appeared over the north Bay of Bengal upto that level. This feature became more marked by the following morning, when a concentrated fall of pressure was noticed over and around the north Bay, indicating that conditions had become markedly unsettled there and were probably concentrating into a depression. By the 9th morning the depression formed and was centred at 0830 hrs. I.S.T. near Lat. 21°N., Long. 89½°E. Moving northnorthwestwards it crossed the Sunderban coast during the early hours of the 10th, and lay over West Bengal with its centre at 0830 hrs. I.S.T. about 50 miles southwest of Berhampore. It then moved slowly westnorthwestwards, and was centred near Asansol at 0830 hrs. I.S.T. of 11th, about 50 miles east of Hazaribagh at 0830 hrs. I.S.T. of the 12th, and about 60 miles east of Banaras at 0830 hrs. I.S.T. of the 13th. Thereafter, it recurved and was centred about 70 miles northeast of Banaras at 0830 hrs. I.S.T. of the 14th. Continuing to move in a northerly direction and simultaneously weakening, it lay as a low pressure area over east Uttar Pradesh and adjoining Bihar on the 15th morning and became unimportant by the next day.

Under the influence of the above depression, the monsoon was vigorous in Chota Nagpur and the adjoining parts of Gangetic West Bengal on the 11th and 12th, in northern parts of Chota Nagpur, southeast Uttar Pradesh and southwest Bihar on the 13th and in southeast Uttar Pradesh on the 14th.

The district averages and the noteworthy amounts of rainfall associated with this depression are given in the following table :

TABLE 10

State and District	District averages on					Particularly heavy falls
	10th	11th	12th	13th	14th	
WEST BENGAL						
West Dinajpur .	..	..	..	..	..	13th, Itahar 5·0″.
Darjeeling . .	2·9	2·0	2·5	..	..	12th, Kalimpong (Obsy.) 5·6″.
Cooch Behar .	..	..	..	..	2·8	14th, Sudder 7·5″.
Burdwan . .	..	2·7	..	..	..	
Bankura . .	4·1	2·8	..	..	..	11th, Simlapal 6·3″, Palasdanga 7·1″, Patrasayer 6·2″.
BIHAR						
Gaya . .	..	..	..	..	..	13th, Daudnagar 4·9″.
Shahabad . .	..	..	..	..	..	11th, Akbarpur 6·7″. 13th, Mahania 6·2″., Akbarpur 6·4″.
Ranchi . .	..	..	..	..	..	12th, Chainpur 5·8″.
Palamau . .	..	..	2·7	..	..	11th, Garhwal 5·0″, 12th, Banka 5·9″, Garu 5·3″.
Manbhum .	..	2·6	2·1	..	..	11th, Barabazar 6·0″ Man Bazar 6·0″. 12th, Chas 6·1″.
Singhbhum .	..	2·8	2·8	..	..	11th, Potka 5·0″. 12th, Gailkuka 6·1″, Potka 5·8″.

TABLE 10—*contd.*

State and District	District averages on					Particularly heavy falls
	10th	11th	12th	13th	14th	
UTTAR PRADESH						
Dehra Dun .	..	..	2·7	..	..	12th, Ambari 5·0″, Raipur 6·1″.
Muzaffarnagar .	..	..	..	..	..	13th, Kandhla 7·0.″
Fatehpur . .	..	..	..	..	4·0	14th, Khajwa 6·6″.
Allahabad . .	..	..	..	..	3·7	14th, Soraon 6·7″, Phulpur 7·0″.
Mirzapur . .	..	..	3·9	2·7	3·4	12th, Hasanpur 7·5″. 14th, Chunar 6·3″.
Jaunpur . .	..	..	..	..	4·5	14th, Kerakat 6·7″.
Rae Bareli . .	..	..	..	..	7·9	14th, Rae Bareli 10·1″, Digbijaiganj 8·2″, Salou 10·5″.
Sultanpur . .	..	..	2·3	..	..	
Pratapgarh . .	..	..	..	..	5·1	14th, Kunda 8·3″.
Bara Banki . .	..	..	..	..	2·1	14th, Sanehighat 5·6″.

10. Shallow land depression from 1st to 5th September 1950.—A low pressure area appeared over northeast Madhya Pradesh, Vindhya Pradesh and the adjoining areas on the 29th August. On this day, a well-marked cyclonic circulation extending upto 7,000 ft. a.s.l. also existed over the north Bay of Bengal. The latter moved inland by the next day and accentuated the first named low pressure area, which moved westwards and concentrated into a shallow depression with its centre near Gwalior by the morning of 1st September. Continuing to move westwards slowly, the shallow depression was centred midway between Kotah and Gwalior on the 2nd morning. Thereafter, it moved southwestwards and weakening gradually, lay as a low pressure area over southeast Rajasthan on the 3rd morning. Weakening further, it became unimportant over lower Sind and the adjoining parts of Saurashtra and Kutch and west Rajasthan by the 5th morning.

In association with the above, active monsoon conditions prevailed over most of northern India and the western half of the Peninsula. Locally heavy rain occurred in Madhya Bharat and the adjoining districts of southeast Rajasthan on the 2nd and in the Punjab (I) on the 3rd and 4th; a State rainguage station Tibri in the Punjab (I) recorded 15·2″ of rain on the 4th. According to press reports, heavy rain also fell at some places in Kashmir. These heavy rains were reported to have caused serious floods in the Ravi, the Beas and the Sutlej, resulting in breaches on the railway lines and landslips in the hills. The worst affected districts were Amritsar, Gurdaspur and Kapurthala. The district averages and noteworthy amounts of rainfall associated with this depression are given in the following table:

TABLE 11

State and District	District averages on			Particularly heavy falls
	3rd	4th	5th	
PUNJAB (I) AND DELHI				
Ambala . .	2·1	..	..	
Kangra . .	..	2·9	..	3rd, Nurpur 5·0″. 4th, Dharamsala (Upper) 5·3″.
Hoshiarpur . .	3·4	..	..	
Jullundur . .	2·8	..	..	3rd, Jullundur 5·4″.
Ferozepore . .	..	3·0	..	3rd, Jalalabad 5·5″. 4th, Ferozepur (Observatory) 7·2″, Ferozepur (Sadar) 7·0″, Muktesar 6·6″, Ferozepur (City) 5·2″.
Amritsar . .	2·7	3·7	..	3rd, Ajnala 5·2″. 4th, Bhuchar 6·4″.
Gurdaspur . .	5·1	8·6	..	3rd, Batala 8·7″, Gurdaspur 5·0″, Pathankot 6·2″. 4th, Aliwal 7·1″, Batala 6·1″, Tibri 15·2″, Gurdaspur 9·3″, Pathankot 7·6″, Dalhousie 7·2″, Madhopur 7·7″.
KASHMIR				
Udhampur . .	3·3	..	..	3rd, Ramnagar 6·1″.
Kathua . .	3·9	..	..	3rd, Kathua 5·3″.

11. Bay of Bengal depression from 9th to 11th September 1950.—A low pressure wave was moving westwards across the north Andaman Sea and was causing unsettled conditions there on the 6th. The unsettled conditions shifted to the east central Bay and neighbourhood where a trough developed by the next morning. Several ships in the central Bay reported rain on the 7th morning. The trough, moving westnorthwestwards, began to affect the upper air circulation along the Circars coast upto 10,000 ft. a.s.l. on the 7th afternoon. Continuing to move westnorthwestwards and intensifying at the same time the trough concentrated into a shallow depression, centred near Lat. 15½° N. Long. 84½°E. at 0830 hrs. I.S.T. on the 9th. It intensified into a depression by the same evening—this was evident from further pressure fall over the area—and then moving slowly northwestwards lay with its centre about 100 miles to the eastsoutheast of Kakinada on the 10th morning. The depression crossed the Circars coast between Kakinada and Visakhapatnam in the early hours of the next day; weakening rapidly, it lay as a low pressure area over coastal Andhradesa at 0830 hrs. I.S.T. on the 11th, and over the extreme northeast Hyderabad and southeast Madhya Pradesh on that evening, and became unimportant by the next day.

During the formation and movement of the depression, widespread rainfall occurred in coastal Andhradesa, Hyderabad and the south Deccan (Desh) between the 9th and 12th. Rainfall was locally very heavy in Hyderbad and the adjoining parts on the 11th and caused breaches in the Secunderabad-Kazipet section of the Nizam's State Railway. A number of houses collapsed in Hyderabad and Secunderabad. The river Krishna was in spate and the low lying areas n the Krishna District in Madras State were inundated.

The noteworthy district averages and particularly heavy falls of rain associated with the depression are given in the following table :—

TABLE 12

State and District	District averages on					Particularly heavy falls
	8th	9th	10th	11th	12th	
MADRAS						
Godavari Agency	..	..	2·2	..	..	12th, Chodavaram 6·7″.
East Godavari .	..	..	3·1	3·5	..	9th, Razole 6·0″. 10th, Mummidivaram 6·3″, Amalapuram 10·9″, Biccavole 9·7″, Gopalpuram 7·3″, Mondapulanka 6·8″, Sakhinetipalli 5·5″, Mukkamala 6·1″, Chintalapudi 9·1″ 11th, Mummidivaram 5·4″ Amalapuram 5·8″, Mondapulanka 7·2″, Annampalli 15·2″, Mukkamala 7·9″, Vella Lock 9·1″, Yerrapotavaram 7·3″, Chintapalle 11·7″.
West Godavari .	..	..	4·7	..	..	10th, Penugonda 7·3″ Bhimavaram 5·3″, Narasapur 7·4″, Palacole 9·8″, Yendagandi 5·4″, Mamuduru 5·2″, Undi 6·7″, Koderu 16·1″, Lakshmipalam 10·5″, Sidhantam 8·3″, Mogalturu 6·0″. 11th, Koderu 6·6″.
Krishna . .	..	..	3·2	..	..	10th, Manginapudi 5·5″, Tidal Lock Bunder 6·3″, Nimagadda Lock 5·3″, Kodur 5·8.″ 11th, Tiruvur 5·9″,
South Kanara .	..	..	2·0	..	..	12th, Beltangady 5·4″, Karkal 4·1″.
TRAVANCORE-STATE						
Kottayam Division	..	..	..	..	..	9th, Neriamangalam 5·4″.
Quilon Division .	..	..	..	..	..	10th, Paravur 5·4″.
HYDERABAD						
Bidar . .	..	..	2·2	3·4	..	
Bir . . .	..	..	..	..	..	9th, Roti 5·2″.
Karimnagar .	..	..	..	4·3	2·3	11th, Karimnagar 6·3″, Sultanabad 6·4″, Sirsalla 5·1″.
Medak . .	..	..	..	3·0	2·3	10th, Siddipet 6·3″. 11th, Medchal 5·0″. 12th, Pocharam 6·8″.
Nanded . .	..	..	..	3·1	..	
Nizambad . .	..	..	..	..	4·3	11th, Banswada 5·0″. 12th, Nizamabad (Observatory) 6·3″, Chintakunta 7·1″, Baridpur 5·8″, Jakora 5·2″, Kallady 6·1″, Ali Sagar 5·3″, Bomendrapally 5·7″, Manchappa 6·9″, Jankampet 6·7″, Navipet 5·1″, Bodhan 6·8″.
Hyderabad . .	..	..	2·5	4·6	2·5	11th, Gandipet 9·5″.
Mahbubnagar .	..	..	2·1	..	..	
Nalgonda . .	..	..	2·7	2·6	..	
Warangal . .	..	..	..	2·5	..	10th, Palancha 5·7″, 11th, Hanamkonda 6·7″.
BOMBAY						
Surat . .	..	..	..	..	..	8th, Jalalpur 11·4″. 9th, Jalalpur 10·0″. 10th, Jalalpur 8·7″. 11th, Jalalpur 6·9″. 12th, Jalalpur 5·5″.
Ahmednagar .	..	..	..	..	2·0	9th, Navasa 8·6″. 12th, Ahmednagar 5·8″, Mirajgaon 5·9″.
Sholapur . .	3·3	..	..	..	..	8th, Madha 8·3″, Pandharpur 5·1″.
Ratnagiri . .	..	..	..	2·0	2·9	12th, Devgad 6·7″, Rajpur 7·8″, Kankavali 6·3″.
Kanara . .	..	..	..	..	2·2	

12. Cyclonic storm in the Bay of Bengal from 12th to 19th September 1950.—On the morning of 10th, the upper winds along the Chittagong-Arakan coast backed to NE/N and a concentrated fall of pressure was noticed in and around central Burma, where an extended low had appeared on the sea-level chart. By the early morning of 11th, Chittagong winds turned southerly showing that the low pressure wave had moved into the northeast Bay. A further concentrated fall of pressure on the same evening over the north Bay and the adjoining coastal Bengal along with a cyclonic circulation extending upto 15,000 ft. a.s.l. showed that the conditions had by then become markedly unsettled over the area. In course of that night, the markedly unsettled conditions rapidly concentrated into a deep depression which lay at 0830 hrs. I.S.T. on the 12th with its centre near Lat. 21°N., Long. 89½°E. S.S. Jalaveera, which was about 180 miles to the southwest of the depression was experiencing passing showers with squalls throughout that day (12th) and also reported a surface wind of 8 B.F. at 0530 hrs. I.S.T. on the 12th. While the wind force as reported by this ship suggested that the depression was apparently developing into a cyclonic storm, such an inference was not supported by available data in regard to pressure defect in and around the area; the nearest reporting station Sandheads had a pressure departure of only 5·9 mbs. at 0830 hrs. I.S.T. on the 12th. By the afternoon of 12th, however, pressure at Sandheads fell rapidly and was 13·7 mbs. below normal at 1730 hrs. I.S.T. which showed that the disturbance had by then definitely intensified into a cyclonic storm of small extent, with centre near Sandheads. According to reports of S.S. Jalaveera, heavy atmospherics prevented the ship from clearing her 06 and 12 GMT observational messages of the 12th. The storm then moved westnorthwestwards, and was centred about 50 miles southeast of Balasore on the 13th morning, when the sea level pressures at Sandheads, Chandbali and Balasore were 12·3, 13·4 and 12·9 mbs. respectively below normal. After crossing the north Orissa coast, south of Balasore, by about midnight the storm weakened into a deep depression over Orissa, with its centre about 70 miles northeast of Sambalpur on the 14th morning. The deep depression continued to move in a westnorthwesterly direction, and lay over north Madhya Pradesh with centre near Mandla on the 15th morning. On the next morning, it was still over north Madhya Pradesh and the adjoining areas

and had its centre between Hoshangabad and Bhopal. The deep depression slightly weakened thereafter, and lay over southeast Rajasthan and adjoining Madhya Bharat on the 17th morning with its centre lying about 70 miles southwest of Kotah. It then started recurving towards the north and was centred about 40 miles southwest of Ajmer on the 18th morning. Recurving further later, it moved in a northeasterly direction and was centred about 50 miles southwest of Delhi, on the morning of the 19th. It then weakened and became unimportant over the Punjab-Kumaon hills by the 20th morning.

In association with the above cyclonic storm and its further movement across the country as a deep depression, fairly widespread rain occurred in Gangetic West Bengal and coastal Orissa on the 12th, and in northeast India outside Assam on the 13th. Chandbali recorded 18″ of rain during the 48 hours ending at 0830 hrs. I.S.T. of 14th. Fairly widespread rain occurred over the region extending from Orissa and Gangetic West Bengal to Gujarat on the 14th and 15th, with locally heavy falls in Orissa on the 14th and in east Madhya Pradesh on the 15th. By the 16th morning, the heavy rainfall belt shifted to northwest Madhya Pradesh and adjoining Madhya Bharat. A number of state raingauge stations in Madhya Bharat reported rainfall exceeding 5″ on the 16th and 17th, the noteworthy amounts being 18·3″ at Mondu and 11·6″ at Nalchha on the 16th. In Gujarat also rainfall was exceptionally heavy on the 17th. Ahmedabad Air port recorded 21″ of rain during the 24 hours ending at 1730 hrs. I.S.T. of the 17th while Ahmedabad city recorded 18″ during the same period. This rainfall was the heaviest recorded at that station during the last 57 years. Mount Abu also reported a rainfall of 18″ in 24 hours on the 18th morning. More than 300 houses were damaged rendering about 3000 families homeless in Ahmedabad and the adjoining areas on account of heavy rains. The rivers Narbada, Tapti and Vishwamitra rose in spate and flooded their banks. Extensive damage to standing crops was caused by the floods in the Kaira district of Gujarat. Locally heavy to very heavy rain also fell in southeast Rajasthan between the 17th and 19th and in the Punjabs and Kashmir between the 18th and 20th. The worst affected areas in Rajasthan were Udaipur and Bikaner where more than 20 persons were reported to have been killed. Damage to property valued at three lakhs of rupees was reported from southeast Rajasthan. Extensive damage was also caused to property and crops in the Punjab (I), particularly in Amritsar, Gurdaspur, Hoshiarpur, Jullundur, Ferozepur and Ludhiana districts. Nearly 8½ lakhs acres of cultivated land were reported to have been affected by the floods. Over 2 lakhs of houses had fallen or were damaged and about seventy persons perished under fallen roofs. Rail and road communications were seriously dislocated. Many villages were isolated for a number of days and food had to be dropped by air to the marooned people in the heavily flooded areas. In Kashmir, the Jhelum breached its banks and submerged large areas of the Kashmir valley. A large number of houses collapsed and thousands were without shelter. The devastation was widespread and the standing crops were seriously affected.

The noteworthy district averages and particularly heavy rainfall amounts are given below:

TABLE 13

State and District	District Averages on							Particularly heavy falls
	14th	15th	16th	17th	18th	19th	20th	
KASHMIR								
Jammu . .	..	..	..	..	4·5	3·3	2·9	18th, Jammu 7·3″, Ranbirsingh Pura 5·5″. 20th, Jammu 5·6″.

TABLE 13—*contd*

State and District	District averages on							Particularly heavy falls
	14th	15th	16th	17th	18th	19th	20th	
Reasi . .	..	..	..	2·3	2·6	2·5	..	
Udhampur .	..	..	..	..	4·8	5·1	4·2	18th, Udhampur 5·0″, Ramnagar 8·8″. 19th, Ramnagar 7·7″, Kishtwar 5·0″. 20th, Ramnagar 7·8″, Kishtwar 5·0″.
Mirpur . .	..	..	..	..	..	2·4	4·4	
Kathua . .	..	..	..	3·5	3·0	2·3	2·2	Kathua 5·2″ on 17th.
Poonch . .	..	..	..	..	2·3	..	..	
Southern Anantnag .	..	..	..	..	..	2·3	..	18th, Durroo 5·9″.
PUNJAB (I)								
Kangra . .	..	..	2·4	3·9	2·5	..	..	18th, Dharamsala (upper) 5·0″.
Hoshiarpur .	..	..	..	3·0	..	..	..	
Jullundur .	..	..	4·1	5·5	..	..	..	16th, Nakodar 6·9″. 17th, Jullunder 7·0″, Nakodar 9·8″.
Ludhiana .	..	..	..	3·9	6·2	..	..	17th, Jagraon 6·8″. 18th Jagraon 17·1″.
Ferozepore .	..	..	..	5·3	2·0	..	..	16th, Moga 6·7″. 17th, Moga 5·0″, Zira 11·9″, Ferozepore (Obsy.) 5·8″, Fazilka 7·1″, Nathana 7·3″, Jaimalwala 7·5″.
Amritsar .	..	..	..	2·8	5·2	..	..	18th, Buchar 5·9″, Amritsar 5·9″, Patti 5·4″.
Gurdaspur .	..	..	..	2·0	5·4	..	..	18th, Aliwal 7·3″, Batala 6·7″, Tibri 9·1″, Gurdaspur 5·6″, Dalhousie (Obsy.) 5·5″. 19th, Dalhousi (Obsy.) 5·8″. 20th, Dalhousi (Obsy.) 7·0″.
BOMBAY								
Ahmedabad .	..	..	..	..	4·6	..	..	17th, Ahmedabad 10·1″, Aslali 6·8″. 18th, Ahmedabad 8·8″, Prantij 15·1″, Modasa 14·5″, Sanand 5·6″, Aslali 6·4″.
Kaira . .	..	..	2·5	4·3	3·2	..	..	16th, Sayat Tank 6·7″. 17th, Mehmadabad 5·4″, Nadiad 5·3″, Mahudha 6·3″, Dakor 6.4″, Pinglaj 5·3″, Savli Tank 6·3″. 18th, Kaira 5·4″, Kapadwanj 6·4″, Anand 5·9″.
Panch Mahals	..	..	..	5·0	2·5	..	..	17th, Halol 7·7″ Jhalod 7·1″.

TABLE 13—*contd.*

State and District	District averages on							Particularly heavy falls
	14th	15th	16th	17th	18th	19th	20th	
MADHYA PRADESH								
Sarguja	2·0	..	..	..	..	..	..	14th, Surajpur 9·3″. 16th, Ambikapur 9·3″.
Mandla	..	2·2	..	..	..	..	..	
Hoshangabad	..	2·1	4·5	..	..	..	..	15th, Makrai 7·8″. 16th, Hoshangabad (Obsy.) 8·1″, Sohagpur 6·4″, Pachmarhi(Obsy.) 7·4″, Narasimhapur 5·5″.
Nimar	..	..	4·5	2·2	..	..	..	16th, Harsud 7·1″.
Betul	..	..	2·3	..	..	..	..	
Balaghat	..	..	..	..	..	..	..	16th, Paraswada 5·1″.

13. Shallow Bay of Bengal depression from 22nd to 24th September 1950.—A low pressure wave moving westwards across Tenasserim into the north Andaman Sea was causing unsettled conditions there on the 17th. The afternoon upper winds on that day along the Tenasserim coast and at Port Blair were in a cyclonic circulation upto 3,000 ft. a.s.l. The unsettled conditions later developed into a trough of low pressure over the north Andaman Sea and neighbourhood. Moving slowly northwestwards and intensifying at the same time, the trough became well-marked on the 19th when the associated upper air circulation extended upto 12,000 to 15,000 ft. a.s.l. over the eastern half of the north and central Bay. The trough continued to move northwestwards and while approaching the Orissa coast, concentrated into a shallow depression, centred about 150 miles to the eastsoutheast of Puri at 0830 hrs. I.S.T. on the 22nd. Moving further northwestwards, it lay with its centre close to the Orissa coast between Puri and Chandbali on the morning of the 23rd, and passed inland by the same afternoon. Weakening rapidly thereafter, it lay as a diffuse low pressure area over Orissa on the 24th morning, and became unimportant by the evening of that day.

The depression, though shallow, caused widespread and locally heavy rainfall in Orissa on the 22nd and 23rd. Widespread rain also fell in coastal Andhradesa on both these days. Some of the noteworthy falls of rain in Orissa and coastal Andhradesa associated with the depression are, Cuttack 7·4″ on 22nd, Chinaganjam (Guntur District) 3·5″ on 22nd, Sambalpur 4·3″ on 23rd and Balasore 3·1″ on 23rd.

14. Bay of Bengal depression from 17th to 22nd October 1950.—On the 12th morning, the seasonal trough over the south Bay of Bengal was rather well-marked off the Coromandel-Ceylon coast, where the associated upper air circulation was mainly cyclonic upto 7,000 ft. a.s.l. Madras had a weak easterly wind at all levels upto 7,000 ft. a.s.l. A fall of pressure which was noticed over Burma and Tenasserim on the 11th evening was followed by rainfall at Victoria Point and in the Malaya-Sumatra region, indicating that a low pressure wave was moving westwards across the Malaya-Sumatra region. Another low pressure wave apparently moved in quick succession across the same region on the 13th. The two together accentuated the seasonal trough over the south Bay and a low pressure area could be located, with its central region near Lat. 8½°N., Long. 90°E. at 0830 hours I.S.T. on the 14th. Moving slowly westnorthwestwards and strengthening at the same time, it concentrated into a depression, centred about 150 miles to the southeast of Madras at 0830 hours I.S.T. of the 17th. Moving initially northwards, the depression was centred on the 18th morning about 170 miles to the southsoutheast of Masulipatam, from where it recurved northeastwards and lay with its centre at 0830 hours I.S.T. on the 19th near Lat. 16°N., Long. 83½°E. Moving northeastwards, but more rapidly than before, it had its centre near Lat. 19°N., Long. 88°E. at 0830 hours I.S.T. on the 20th. Continuing to move in the same direction, the depression was centred on the 21st morning near Lat. 21°N., Long. 89½°E. Thereafter, it took a northerly course, and crossing the Sunderbans coast near Barisal on the same night, lay near Faridpur in Eastern Pakistan on the morning of the 22nd. Weakening rapidly, the depression became unimportant by the next day.

In association with the depression, the northeast monsoon set in in the south of the Peninsula on the 16th, and widespread rain occurred in the Madras State, Travancore-Cochin and Mysore on the 17th and 18th. Nellore reported 23″ of rain in the 36 hours ending at 0830 hours I.S.T. on the 18th. Widespread rain also fell successively in Orissa, West Bengal, Eastern Pakistan and Assam between the 19th and 23rd. Rainfall was locally heavy along the north Circars and south Orissa coasts on the 19th. According to the press reports, the heavy downpour in the Eastern Himalayas caused several hill streams in Assam to be in spate. Many houses were washed away and crops were damaged in the Sadiya Frontier tract, half of Sadiya town having been submerged under 3 to 4 ft. of water on the 21st.

The noteworthy district averages of rainfall and amounts of particularly heavy rainfall are given in the following table:

TABLE 14

State and District	District averages on						Particularly heavy falls
	17th	18th	19th	20th	21st	22nd	
WEST BENGAL							
Cooch Behar	..	..	..	..	2·6	2·5	
Jalpaiguri	..	..	..	..	2·1	..	
MADRAS							
Srikakulam	..	..	2·5	..	..	..	
Visakhapatnam	..	..	2·3	..	..	..	
East Godavari	..	..	3·1	..	..	..	16th, Kakinada 6·1″. 19th, Kakinada 6·0″, Mummidivaram 5·3″, Amalapuram 6·1″, Mandapulanka 5·4″, Annampalle 8·5″, Mukkamala 5·3″, Chintalapudi 6·8″, Yerrapotavaram Lock 5·0″.
West Godavari	..	..	2·2	..	..	..	19th, Koderu 5·9″, Sidhantham 5·1″.
Nellore	2·5	5·7	..	..	..	..	17th, Nellore 5·8″. 18th, Sulurpet 7·1″, Nellore 17·5″, Gudur 9·8″, Venkatagiri 5·0″, Atmakur 5·7″, Kavali 9·7″, Lokapalli 11·6″, Krishnapatam 15·7″, Nellore Anicut 14·7″, Narukuru 9·7″, Sarvepalli 8·0″, Buchireddipalem 5·9″, Sangam 6·8″.
Chingleput	3·7	..	..	..	..	..	17th, Athipet 7·2″, Ponneri 5·4″, Vavalur 8·4″, Vallur 8·0″.

15. Bay of Bengal cyclonic storm from 16th to 20th November 1950.—By the 11th of November, dry continental air had spread over the Peninsula as far south as Lat. 10°N. At the same time, with the accentuation of the seasonal trough over the south Bay of Bengal, easterly maritime air began to spread over the south Bay and the south Peninsula upto Lat. 15°N. The convergence of the two air masses led to active northeast monsoon conditions being established over the coastal districts of Tamilnad by the 13th, and to widespread rainfall in the south Peninsula between the 13th and 15th. By the 15th morning the western end of the seasonal trough had become very well marked, and conditions were unsettled over the southwest Bay. The associated upper air circulation over the area was largely cyclonic upto 10,000 ft. a.s.l. A concentrated fall of pressure, with negative pressure departure over the north Coromandel and south Circars coasts was noticed on the next morning's chart, indicating that the unsettled conditions had concentrated into a depression with centre near Lat. 11½°N., Long. 83½°E. at 0830 hours I.S.T. of that day. As indicated by the steady extension of rainfall belt along the Circars and south Orissa coasts, the depression followed a northerly track initially and intensifying at the same time, lay as a deep depression with centre near Lat. 15°N, Long. 84°E. on the morning of the 17th. Several ships in the field of the deep depression reported winds with speed of 20 m.p.h. or more, and the negative pressure departures along the Circars coast were of the order of 7 to 8 mb. Recurving northeastwards, the deep depression moved rapidly and intensified into a cyclonic storm by 0530 hours I.S.T. on the 18th, with its centre near Lat. 19°N., Long. 87½°E. The cyclonic storm was centred near Lat. 20°N., Long 88½°E. at 0830 hours I.S.T. when Sandheads which was quite close to the storm centre, recorded a negative pressure departure of 12·4 mb. The storm continued to move northeastwards and lay with centre near Lat. 21½°N., Long. 90°E. at 1730 hours I.S.T. of that day. Thereafter, it began to weaken rapidly and by 0130 hours I.S.T. of the 19th, it lay as a deep depression, centred close to east Sundarbans between Barisal and Chittagong. Within the next few hours it weakened further and, crossing coast between Barisal and Chittagong, lay as a depression over Eastern Pakistan at 0830 hours I.S.T. of 19th with its centre about 150 miles northwest of Chittagong. The depression then filled up rapidly and at 0830 hours I.S.T. of 20th there existed only a diffuse low over lower Assam and adjoining Eastern Pakistan, which became unimportant by the evening of the same day.

The cyclonic storm was responsible for an abnormal wet spell in Orissa, Gangetic West Bengal, Assam and Eastern Pakistan during the period 17th to 20th. Rainfall was locally very heavy along and near the track of the cyclone. Chandbali and Cuttack reported 8″ each and Balasore 7″ on the 18th. Calcutta had 6″ of rain during the 24 hours ending at 1730 hours I.S.T. of 18th. The British Cargo vessel S.S. Keldergate while sailing off the Orissa coast between Puri and Chandbali on the 17th-18th night was reported to have run aground due to bad visibility and suffered severe damage. The high winds at Calcutta reached a speed of 54 m.p.h. in gusts several times on the 18th. In association with the cyclonic storm there was a marked incursion of cold continental air from northerly latitudes into the greater part of the country where colder nights prevailed during the second half of November.

The noteworthy district averages of rainfall and amounts of particularly heavy rainfall are given in the following table:

TABLE 15

State and District	District averages on					Particularly heavy falls
	16th	17th	18th	19th	20th	
ASSAM						
Cachar	..	..	..	3·4	..	
Tripura State	..	..	3·9	..	..	18th, Agartala 5·3″, Sonamura 9·7″, Udaipur 5·9″.
Khasi and Jaintia Hills	..	..	..	4·6	..	19th, Cherrapunji 7·0″, Mawsynram 6·0″.
Cachar (North Cachar Hills)	..	..	..	5·2	..	19th, Haflong 6·7″.
WEST BENGAL						
24 Parganas	..	..	3·9	..	..	18th, Gosaba 6·0″.
Nadia	..	..	3·5	2·7	..	
Midnapore	..	..	2·6	..	..	
Hooghly	..	..	3·3	..	..	18th, Boinchee 6·3″. 19th, Chanditala 5·1″.
Howrah	..	..	6·2	4·7	..	18th, Amta 6·2″.

16. Cyclonic storm in the Bay of Bengal from 2nd to 6th December 1950.—On the morning of 1st December the movement of a low pressure wave from the east accentuated the seasonal trough over the southeast Bay of Bengal and the adjoining south Andaman Sea. The upper winds strengthened along the Tenasserim coast and a belt of negative pressure departures developed over the area. By 0830 hours I.S.T. of the next day, the unsettled conditions in the southeast Bay concentrated into a depression, centred near Lat. 8°N. Long 85½°E. The depression moved initially in a northnorthwesterly direction and by 1730 hours I.S.T. of the same day, was centred near Lat. 9°N., Long. 85°E. It then intensified into a deep depression and, recurving at the same time was centred at 0830 hours I.S.T. of 3rd near Lat. 11½°N., Long. 86½°E. By 1730 hours I.S.T. on the 3rd, the deep depression had intensified into a cyclonic storm, with centre within a degree of Lat. 12°N., Long. 87°E. The cyclonic storm continued to move in a northeasterly direction without further intensification, and was centred near Lat. 12½°N., Long. 88°E. on the morning of the 4th. It was centred near Lat. 13½°N., Long. 89°E. at 1730 hours I.S.T. on the 4th and near Lat. 14½°N., Long. 90½°E. on the morning of 5th. S.S. Jalavijaya, which was in the southeast quadrant of the storm between the 3rd and 4th, recorded the following observations.:—

TABLE 16

Date	Time GMT	Ship's position		Wind at time of observation		Barometer		Weather at time of observation
		Latitude	Longitude	Direction	Force in knots	Pressure	Tendency	
3rd December 1950	0000	11°19′N	88°52′E	160°	6	29·61″	Rising	Overcast with rain.
Do.	0300	11°40′N	89°20′E	180°	6	29·67″	Do.	Passing showers.
Do.	0600	11°45′N	89°30′E	180°	5	29·65″	Falling	Overcast.
Do.	0900	11°50′N	89°40′E	170°	5	29·55″	Do.	Overcast.
Do.	1200	11°57′N	89°37′E	190°	8	29·55″	Steady	Mainly cloudy with squalls and rain.
Do.	1500	11°57′N	89°37′E	200°	8	29·60″	Steady	Overcast.
Do.	1800	11°57′N	89°37′E	190°	9	29·61″	Rising	Mainly cloudy with drizzle.
4th December 1950	0000	11°56′N	89°38′E	180°	9	29·57″	Rising	Passing showers.
Do.	0300	11°56′N	89°38′E	200°	9	29·65″	Rising	Drizzle.
Do	0600	11°36′N	89°50′E	180°	8	29·59″	Falling	Drizzle.
Do	0900	11°36′N	89°52′E	220°	10	29·53″	Falling	Drizzle.
Do	1200	11°32′N	89°54′E	200°	9	29·60″	Rising	Squalls with continuous heavy rain.
Do.	1800	11°32′N	89°54′E	230°	7	29·68″	Rising	Lightning with drizzle.

By the evening of 5th, the storm weakened into a depression, centred near Lat. 15½°N., Long. 92°E. and by the next morning it further weakened into a shallow depression with its centre about 150 miles to the northnorthwest of Table Island. The next morning it became unimportant.

Under the influence of the above cyclonic storm there was an unusual wet spell in the Andaman Islands. Local or fairly widespread rainfall, at times heavy, was also reported from Deltaic Burma between the 3rd and 6th.

II.—ACCOUNT OF WESTERN DISTURBANCES DURING 1950

About two-thirds of the total number of western disturbances which moved across north India during 1950 were feeble, and confined their activity mainly to northwest India and the adjoining areas. In February the third disturbance which was fairly active, induced a secondary which later developed into a depression and was responsible for widespread precipitation over the area traversed by it. In its wake, a cold wave swept across north India. A western disturbance moving from Baluchistan to the hills of the Punjab (I) early in April also caused a cold wave over West Pakistan. A few of the disturbances and their secondaries travelled as far east as Assam and caused thunderstorm activity in Rajasthan, Uttar Pradesh, the central parts of the country and northeast India.

A list of the disturbances, classified according to the nature of precipitation caused by them, is given in the table below. A description in detail of some of the more important disturbances is also added.

TABLE 17

Nature of precipitation	Number of western disturbances during											
	January	February	March	April	May	June	July	August	September	October	November	December
Widespread	4	3	3	1	..	..	..	..	..	..	..	1
Local	..	..	..	..	1	2	..	..	..	..	..	..
Little or nil	4	3	3	6	2	..	..	..	..	2	4	3
Number of disturbances in each month	8	6	6	7	3	2	..	..	..	2	4	4

1. The western disturbance and its secondary during the period 17th to 21st January 1950.—An active western disturbance appeared over Baluchistan on the 17th. Moving in a northeasterly direction, it lay over southwest Punjab on the 18th and passed away across the hills of west Uttar Pradesh by the 20th after inducing a 'secondary' over Sind on the 19th. The latter moved eastnortheastwards and became unimportant over northeast Uttar Pradesh by the 21st. In association with these disturbances, fairly widespread rain occurred in Baluchistan, North-West Frontier Province, Kashmir and the Punjab (P) on the 18th and 19th, in the Punjab (I) on the 19th and 20th, and in and near the hills of west Uttar Pradesh on the 20th and 21st. Local showers also occurred in Sind on the 19th, in west Rajasthan on the 19th and 20th and in the Punjab (P) on the 20th. Locally heavy to very heavy rain occurred on that day in the north Punjab (I) with moderate to heavy snowfalls on the Punjab-Kumaon hills; Dalhousie recorded 5".

2. Western disturbance and its associated secondary, 5th-10th February 1950.—The disturbance, which was fairly active, appeared over north Baluchistan on the 5th and passed away across the hills of the Punjab (I) on the 7th. It caused local showers over north Baluchistan on the 6th and widespread rain or snowfall in Kashmir and Jammu on the 7th. An active secondary induced by the primary disturbance, lay over north Baluchistan on the 7th, and developed into a depression over the Punjab (P) on the next day. It then moved eastnortheastwards and filled up over the Punjab (I) on the 10th, after giving widespread rain or snow in north Baluchistan and the Punjab (P) on the 8th and in the North-West Frontier Province and the Punjab (I) on the 8th and 9th. In association with this disturbance widespread or local rain also fell in west Uttar Pradesh on the 8th and 9th, and in east Uttar Pradesh on the 9th.

A very steep pressure gradient which set in in the wake of the above secondary over western Pakistan, western India and the north and east Arabian Sea by 1730 hours I.S.T. of 8th, led to marked, strong and gusty winds and widespread dustfog or dust haze over the area which extended to west Uttar Pradesh, the central parts of the country the Deccan and Kutch between the 10th and 13th. Also cold dry air from the north spread forward as a cold wave from Western Pakistan into northwest India, and swept eastwards through Uttar Pradesh to northeast India and southwards into the central parts of the country and the north Peninsula. Day and night temperatures fell to as low as 15° to 20°F. below their normal values. In Rajasthan and the adjoining parts of the Punjab (I), night temperatures reached very low values to near or below the freezing point between the 10th and 13th. Several deaths, due to exposure to the cold wave, were reported from the Punjab (I), Uttar Pradesh and Gujarat. Damages to crops were also caused in certain parts of Rajasthan, the Punjab (I), Uttar Pradesh, Bihar, Madhya Bharat, Madhya Pradesh, Saurashtra and the Bombay Province.

3. The western disturbance and its secondary during the period 19th to 24th March 1950.—An active western disturbance appeared over Baluchistan on the 19th evening. Moving eastnortheastwards, it lay over the Punjab (I) on the 22nd morning, when another secondary disturbance developed over north Madhya Bharat. The primary disturbance moved away northeastwards across the hills of the Punjab (I) by the 23rd, while the secondary moved to Vindhya Pradesh and eventually became unimportant there by the 24th.

In association with these disturbances fairly widespread thundershowers occurred in the North-West Frontier Province on the 21st and 23rd, in the Punjab (P) on the 21st, in the Punjab (I) and Kashmir between the 21st and 23rd and in Uttar Pradesh on 22nd and 23rd. Local showers also occurred in Baluchistan between the 19th and 21st, in the Punjab (P) on the 20th, 22nd and 23rd, in west Rajasthan on the 21st and 22nd, and in west Uttar Pradesh on the 21st and 24th. Dalhousie had 5" of rain on the 22nd; also a few heavy falls were reported from the North-West Frontier Province, Kashmir and west Uttar Pradesh on that day. Some of the stations in these areas reported hailstorms. A severe squall with wind speed reaching a maximum of 101 m.p.h. in gust was experienced at Allahabad at 2010 hours I.S.T. of 21st, causing the roofs of the Aerodrome Control Building and of some of the nearby residential barracks being blown off.

III—LOCAL STORMS

Of the local storms reported in the newspapers, the following are noteworthy:

Place	Date	Time	Classification of storm	Loss of human life	Remarks
Dibrugarh	6th February	..	Severe hail-storm	1	Hailstones of the size of tennis balls were reported to have fallen. 19 persons were injured and four heads of cattle were lost. Many trees were uprooted and several houses blown down.
Lucknow	20th February	..	Severe hail-storm	1	The storm prevented a plane from landing at Lucknow. The plane ultimately crashed and the pilot was killed.
Jaitara (Madhya Pradesh)	16th March	Evening	Severe hail-storm	..	Hailstones of the size of mangoes were reported to have killed cattle and caused damage to crops resulting in a loss estimated at Rs. 2 lakhs.
Allahabad	21st March	Evening	Severe hail-storm followed by squall.	1	A number of trees were uprooted causing road blocks. Electric and telephone connections in some parts of the city were cut off. Maximum wind speed in squall was estimated to have reached 100 m.p.h. 1·33″ of rain was recorded.
Tirupur (Madras State)	11th April	Evening	Severe thunderstorm	..	The storm was accompanied by high winds. Several buildings were damaged and trees uprooted. Power supply in Tirupur town was cut off. Traffic was suspended for some time. Sheep and cattle were reported to have been killed in many places.
Calcutta	11th April	Evening	Duststorm & nor'-wester.	..	Wind speed was reported to have reached 57 m.p.h. and temperature fell by 10°F. Two men were injured by falling trees.
Diamond Harbour	1st May	Evening	Nor'-wester	50	A boat capsized in the Hooghly, drowning 50 persons.
Bangalore	3rd May	Evening	Thunderstorm	..	The storm was accompanied by hail. Wind speed during a squall reached about 60 m.p.h.
Tirupathi (Madras State)	4th May	Early morning.	Thunderstorm	..	Several trees were uprooted and bus traffic had to be suspended for 6 hours. Heavy rain (1·5″) accompanied the storm.
Badarpur	6th May	..	Nor'-wester	..	More than 100 buildings collapsed. Seven persons were injured.
Gopalpur Camp. (45 miles from Burdwan)	6th May	..	Storm	..	Several refugees in the camp were rendered shelter less.
Purnea	8th May	..	Severe storm	2	Several trees were uprooted killing 2 and injuring 3 persons.
Calcutta	10th May	Night	Severe duststorm	..	The storm was accompanied by a squall in which wind speed was reported to have reached 60 m.p.h.
Calcutta	12th May	Evening	Nor'wester	..	The nor'-wester was preceded by a squall in which wind speed reached 45 m.p.h. in Calcutta and 54 m.p.h. in the suburbs. Several huts were damaged and trees uprooted. Temperature fell by 15°F at Dum Dum.
Cooch Behar	14th May	Night	Thunderstorm	1	One refugee camp in the town was blown off and 400 refugees made homeless. Considerable damage to crops was also reported.
Ambala	18th May	Night	Severe hail-storm	..	Wind speed during the storm was reported to have reached 75-80 m.p.h. Considerable damage to property and crops was reported. Water and power supply in the Military area of the town broke down. Communications—telegraph and telephone—were disrupted and traffic was brought to a standstill. Hail stones which were reported to be of the size of ping pong balls caused considerable damage in the market area of the city. Three aircraft hangars, the roof of the Flying Control Building and several aircraft were damaged. 36 persons were injured.
Jamshedpur	18th May	Evening	Thundersquall	..	Wind speed during squall was estimated to have reached 100 m.p.h.
Panipat	19th May	Afternoon	Duststorm followed by rain.	..	The storm caused a serious breakdown of telegraphic communication near Panipat.
Nainital	19th May	Night	Duststorm	..	The lighting system in the city was paralysed for 3 hours.

Place	Date	Time	Classification of storm	Loss of human life	Remarks
Agra District . . .	20th May	..	Thunderstorm	...	Roofs of several buildings were blown off. Trees and telegraph poles were uprooted at several places in Agra District.
Delhi	20th May	Afternoon	Duststorm	1	Wind speed reached 68 m.p.h. All outdoor activity was at a standstill for an hour in Delhi.
Tezpur	24th May	..	Thunderstorm	6	A boat capsized in the Brahmaputra killing 6 persons.
Jammu	28th May	Night	Thunderstorm	..	A large number of trees were uprooted and roofs of several buildings were damaged. Electric supply was affected for some time.
Hyderabad . . .	29th May	Evening	Thunderstorm accompanied by squall.	..	Low lying areas in the city were flooded. Telephone system and power supply were dislocated for sometime. The wind speed during squall was reported to have reached hurricane force.
Dum Dum . . .	31st May	..	Nor-wester	..	Wind speed reached 62 m.p.h. at one stage. Nearly ½" of rain fell in about half an hour and temperature dropped by 17°F from 92°F just before the storm to 75°F after the storm.
Dakor (Gujarat) . .	5th June	Evening	Thunderstorm	..	300 houses were damaged and caused loss to property estimated at Rs. 50,000. Traffic was dislocated in some places.
A village in Tanjore District (Madras State)	22nd August	Evening	Severe thunderstorm	..	The storm destroyed a bamboo grove and uprooted a palmyra tree in its path. A column of water 10 ft. in height and five feet in diameter spouted up from a local tank when the storm in the nature of a tornado passed over it.

IV.—WINDS OF FORCE NINE OR MORE IN THE INDIAN SEAS

Excluding dates of storms and depressions, a description of which has been given above, winds of force 9 or more were recorded on ships in the Indian Seas during the year 1950 on the following occasions:

Date	Name of ship	Approximate position		Date	Name of ship	Approximate position	
		Lat. °N.	Long. °E			Lat. °N	Long. °N.
10-6-1950	S.S. W/s Ceylon . . .	13·5	56·4	16-7-1950	S.S. Toscana	12·7	60·8
10-6-1950	S.S. Discovery	13·7	57·7	17-7-1950	S.S. Blitar	12·5	60·0
11-6-1950	S.S. Discovery	11·7	60·0	18-7-1950	S.S. Blitar	12·4	61·6
4-7-1950	S.S. Erobona	16·3	63·5	25-7-1950	S.S. Badarpur	16·2	70·3
4-7-1950	S.S. Dara	15·8	63·8	26-7-1950	S.S. Badarpur	15·0	71·7
5-7-1950	S.S. Erodara	15·0	64·3	27-7-1950	S.S. Orion	11·7	58·7
6-7-1950	S.S. Trelyon	9·5	52·3	9-8-1950	S.S. Orange	11·8	59·2
9-7-1950	S.S. Welterreder . . .	12·4	57·3	10-8-1950	S.S. Orange	10·4	59·4
14-7-1950	S.S. Kaipaki	8·5	52·4	5-9-1950	S.S. Wild Goose . . .	18·5	66·4
14-7-1950	S.S. Kaipaki	8·3	53·3				
14-7-1950	S.S. British Marquis . . .	17·8	64·8				

No ship in the Bay of Bengal reported wind of force 9 B.F. or more unconnected with cyclonic storm during 1950.

PUBLICATIONS OF THE INDIA METEOROLOGICAL DEPARTMENT

(Complete list, upto July, 1954, including those Publications which are now out of print.)

Notes:—

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2. INDIAN DAILY WEATHER REPORT, WEEKLY WEATHER REPORT, AND MONTHLY WEATHER REPORT ARE AVAILABLE FOR SALE IN THE OFFICE OF THE DEPUTY DIRECTOR GENERAL OF OBSERVATORIES (FORECASTING) METEOROLOGICAL OFFICE, POONA-5.
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Nos. IX to XII, XV, XVIII, XX, XXII, XXIV to XXXII, XXXVI, XLI, XLII, XLV, LI, LV, LVIII to LXII, LXIV, LXV, LXVIII, LXIX and LXXII.	J. Evershed.
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No. XXXV.	T. Royds and S. Sitarama Ayyar.
Nos. XXXIX and XLIX.	J. Evershed and T. Royds.
Nos. XLIV, LXXVI and LXXVII.	A. A. Narayana Ayyar.
No. XLVI.	J. Evershed and A. A. Narayana Ayyar.
No. LXVII.	J. Evershed and P. R. Chidambara Iyer.
No. LXXXII.	P. R. Chidambara Iyer.
Nos. LXXXVI, LXXXVII, XCIX.	A. L. Narayan.
No. XCI.	A. S. Rao.
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No. XCVI.	M. Salaruddin.
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Nos. XCVIII, CVIII.	Departmental.
No. CI.	C. P. S. Menon.
No. CIX.	T. Royds and A. L. Narayan.
No. CXI.	T. Royds and M. Salaruddin.
No. CXVIII.	A. L. Narayan.
No. CXIX.	A. K. Das.
Nos. CXX to CXXV	Departmental.
No. CXXVI.	A. K. Das and N. Rajewara Rao.
No. CXXVII	A. K. Das and K. Setumadhavan.
No. CXXVIII.	Departmental.
No. CXXIX.	Ditto.
No. CXXX.	Ditto.
No. CXXXI.	Ditto.
Supplement to No. CXVIII.	Ditto.
Supplement to No. CXIX.	Ditto.

X. MEMOIRS OF THE KODAIKANAL OBSERVATORY.—

Vol. I—

Part I.	The Spectrum of Sunspots. Rs. 1-8.	J. Evershed.
Part II.	Results of prominence observations. Rs. 2.	J. Evershed and Mary A. Evershed

XI. PUBLICATIONS CONTAINING MAINLY DATA.—

Bombay Magnetic Data—

Magnetic, meteorological and seismological observations made at the Government Observatory, Bombay—
1845-97.*
1898-99. Rs. 5-8.†
1900-01. Rs. 4-8.

* Only volumes for 1891, 1892 and 1896 are available. The rest are out of print.

† Cut of print.

PUBLICATIONS CONTAINING MAINLY DATA.—(contd.)

Bombay Magnetic Data—(contd.)

Magnetic, meteorological, and seismological observations made at the Government Observatories, Bombay and Alibag—		
1902-05.	Rs. 14-10.	Departmental.
1906-10.	Rs. 15-0.	
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1922.	Rs. 7-6 or 11*s.* 9*d.*	
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1925.	Rs. 9-12 or 16*s.*	
1926.	Rs. 10-12 or 17*s.* 6*d.*	
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1931.	Rs. 12-6 or 20*s.*	
1932.	Rs. 13-14 or 22*s.* 6*d.*	
1933.	Rs. 11 or 18*s.*	
1934.	Rs. 11-4 or 17*s.*	
1935.	Rs. 9-14 or 16*s.* 6*d.*	
1936.	Rs. 11 or 17*s.* 3*d.*	
1937.	Rs. 14-14 or 23*s.*	
Magnetic, meteorological, atmospheric, electric and seismographic observations made at the Government Observatories, Bombay and Alibag—		
1938.	Rs. 9-8 or 15*s.*	
1939.	Rs. 14-14 or 23*s.*	
1940.	In the Press.	
1941.		
1942.		
1943.		
1944.		
Colaba Magnetic Data. 1846—1905, Part I. Rs. 15.		N. A. F. Moos.
Colaba Magnetic Data. 1846—1905, Part II. Rs. 30.		Ditto.

India Weather Review—

Annual Summaries for the years 1891—1920 (30 Parts). Each Rs. 2.‡		Departmental.
1921-22.	Each Rs. 11-4.	Departmental.
1923.	Rs. 12-8 or 20*s.*	
1924.	Rs. 8-12 or 14*s.* 6*d.*	
1925.	Rs. 10-2 or 16*s.* 9*d.*	
1926.	Rs. 13-12 or 22*s.*	
1927.	Rs. 10-12 or 17*s.* 6*d.*	
1928. Parts A to G.	Each Part priced separately.	
1929. Introduction and Parts A to F.		
1930. Ditto.		
1931. Ditto.		
1932. Ditto.		
1933. Introduction and Parts A to D.		
1934. Ditto.		
1935. Ditto.		
1936. Ditto.		
1937. Ditto.		
1938. Introduction and Parts A to C.		
1939. Ditto.		
1940. Ditto.		
1941. Ditto.		
1942. Ditto.		
1943. Ditto.		
1944. Ditto		
1945. Ditto		
1946. Ditto.		
1947. Introduction and Parts A and B (Part C in Press).		
1948. Parts A, B. and C.		
1949. Part B. (Part A and Part C in Press).		

Rainfall Tables—

(i)	Daily Rainfall of India for the years 1891—1922 (32 volumes, Rs. 9 a volume). †	Departmental.
	Daily Rainfall of India for the years 1923-24, each Rs. 10-12 or 17*s.* 6*d.*	Ditto.
	Daily Rainfall of India for the years 1925—1945, each volume Rs. 68-8.	Ditto.
(ii)	Monthly Rainfall of India, 1901—1922 (22 volumes). Rs. 2 a volume.	Ditto.
	Monthly Rainfall of India 1923-24, each volume Rs. 2-8 or 4*s.* 6*d.*	Ditto.
	Monthly Rainfall of India 1925—1945, each volume Rs. 16-9.	Ditto.
(iii)	Rainfall of the Bombay Presidency for the years previous to 1891. Vols. I—VI. Rs. 5-12 to Rs. 6-8.	N. A. F. Moos.

Memorandum on the rainfall and other Weather conditions of India (Annual). Departmental.

Monthly Weather Reviews and Reports—

(i)	Monthly Weather Reviews for each month, January 1891 to December 1920, each As. 12.*	Ditto.
(ii)	Monthly Weather Report, each As. 8.	Ditto.

Weekly Weather Reports—

Weekly Weather Report, published in Poona. Monthly subscription Re 1.	Ditto.

Daily Weather Reports—

India Daily Weather Report, published in Poona. Monthly subscription Rs. 3 without evening chart and Upper Air Report. (Rs. 5 complete.)	Ditto.

* Some issues are out of print.

† Volumes for 1891, 1914 to 1924, 1932 to 1937 are out of print.

‡ Volumes for 1902—1906, 1910 and 1912—1917 are out of print.

PUBLICATIONS CONTAINING MAINLY DATA—(contd.)

Regional Weather Reports for—

Bombay, Calcutta, Madras, Nagpur, New Delhi — Monthly subscription Rs. 2 for each region.

Upper Air Data—

(i)	Upper Air Data Parts 1—14 (1928 to 1935) each part priced Rs. 4-4 or 7*s*.	Departmental.
(ii)	Upper Air Data Part A (1936—1943) each issue priced separately.	Ditto.
(iii)	Upper Air Data Part B (1936—1940) and 1942 and 1943 each issue priced separately.	Ditto.

Seismological Bulletins—

(i)	Seismological Bulletins, Quarterly. (1938—1942)		Ditto.
(ii)	Seismological Bulletins, 1946, 1947 (roneoed)		
	1943 January—March		
	1943 July—September	Quarterly.	Ditto.
	1944 January—March		
(iii)	Seismological Bulletins, 1948 January and February		
	1950		Ditto.
	1951 January to July	Monthly (roneoed).	

XII. SEASONAL FORECASTS.—

(i) Memorandum on the probable amount of rain and snow in Northwest India in January, February and March.
(ii) Memorandum regarding the probable amount of monsoon rainfall.
(iii) Memorandum on the rainfall of June and July and the probable amount during August and September.
(iv) Statement of the Rainfall and snowfall of Northwest India in January, February and March.
(v) Statement of actual rainfall in the monsoon season, June to September.

XIII. REPORT ON THE ADMINISTRATION OF THE METEOROLOGICAL DEPARTMENT OF THE GOVERNMENT OF INDIA (ANNUAL).—

(i) Annual Report of the Director General of Observatories on the observatories of Kodaikanal, Madras, Bombay and Alibag, accompanying their Annual Reports. As. 8.
(ii) Report on the administration of the Meteorological Department of the Government of India.
(iii) Report of the Kodaikanal Observatory 1922—1950.

XIV. INDIAN JOURNAL OF METEOROLOGY AND GEOPHYSICS (QUARTERLY).—

Vol. 1—

No. 1. January 1950. Rs. 2-6 or 4*s*.
No. 2. April 1950. Rs. 2-4 or 3*s*. 9*d*.
No. 3. July 1950. Rs. 2-4 or 3*s*. 9*d*.
No. 4. October 1950. Rs. 1-14 or 2*s*. 9*d*.

Vol. 2—

No. 1. January 1951. Rs. 2-6 or 4*s*.
No. 2. April 1951. Rs. 2-4 or 3*s*. 9*d*.
No. 3. July 1951. Rs. 2-4 or 3*s*. 9*d*.
No. 4. October 1951. Rs. 1-14 or 2*s*. 9*d*.

Vol. 3—Onwards.

Rs. 2-8 or 4*s*. per issue. Annual Subscription. Rs. 10 or 16*s*.

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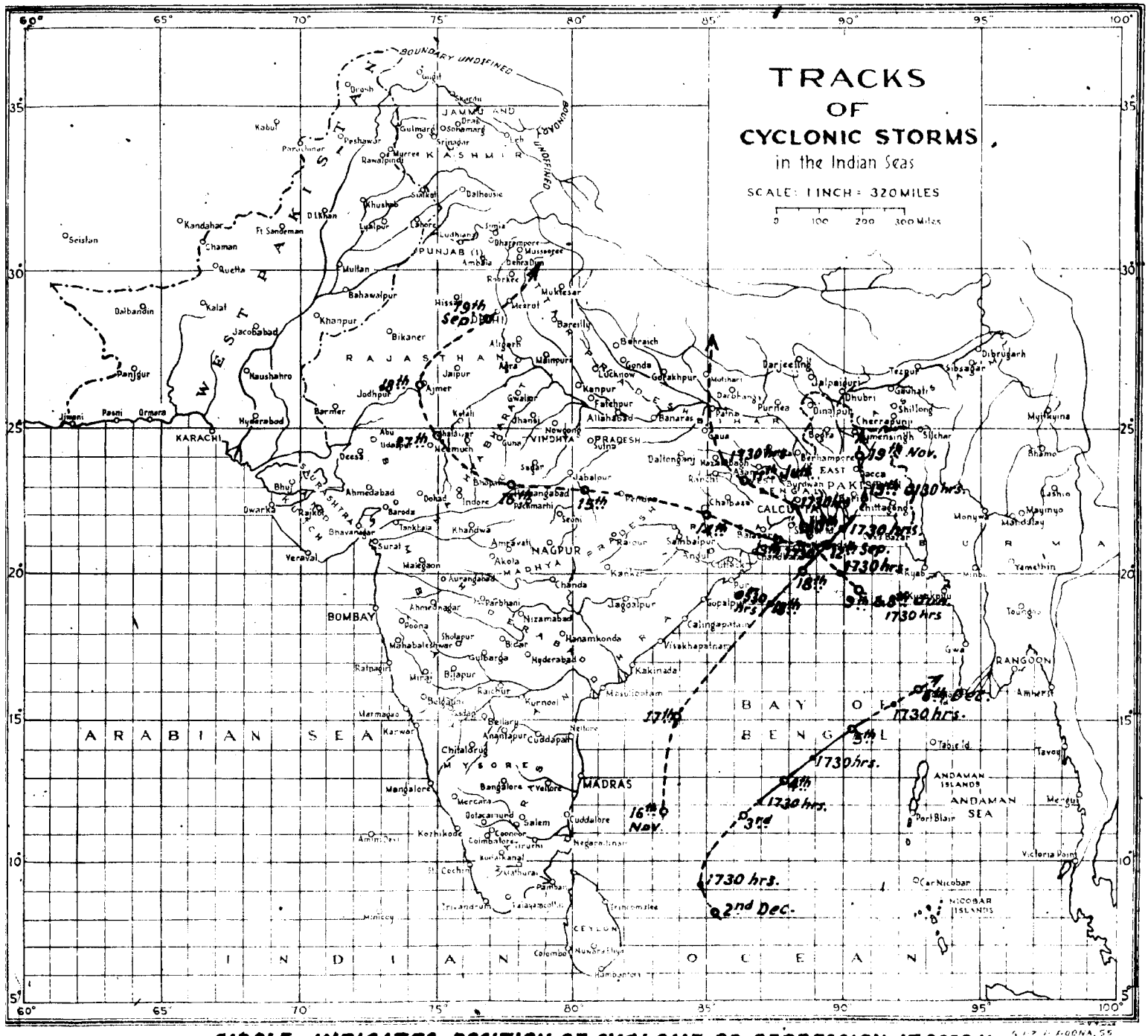
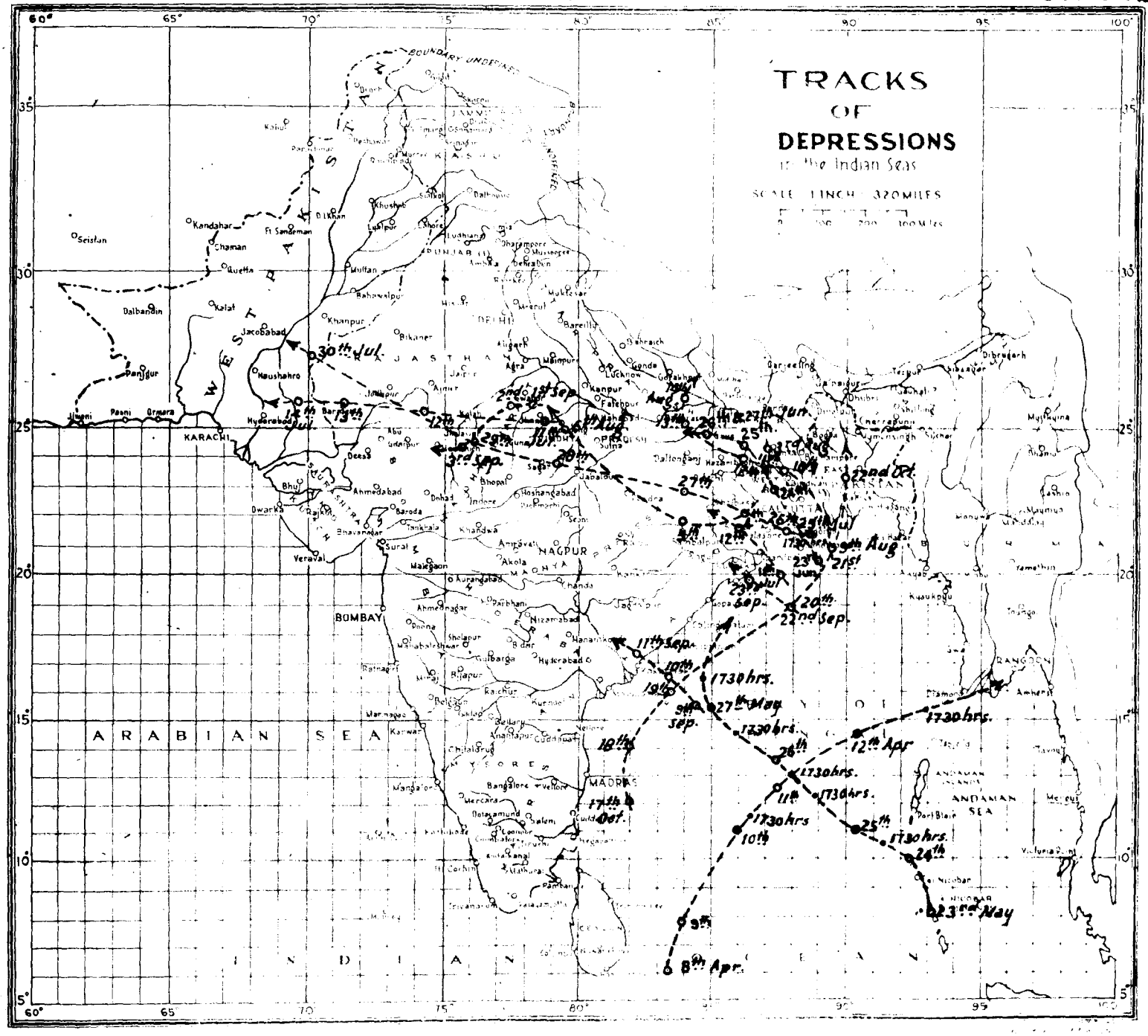


CIRCLE INDICATES POSITION OF CYCLONE OR DEPRESSION AT 0830 HRS.

------- Depression ——— Storm ——— Severe Storm



CIRCLE INDICATES POSITION OF DEPRESSION AT 0830 HRS.